IN THE CLAIMS:

1. An electron gun comprising:

an RF cavity having a first side with an emitting surface and a second side with a transmitting and emitting section; and

a mechanism for producing an oscillating force which encompasses the emitting surface and the section so electrons are directed between the emitting surface and the transmitting and emitting section to contact the emitting surface and generate additional electrons and to contact the transmitting and emitting section to generate additional electrons or escape the cavity through the transmitting and emitting section, with a resulting gain of electrons in a unidirectional flow after N_{RF} periods is $[\delta_2\delta_1(1-T)]^N$, where N is an integer greater than or equal to one, δ_1, is the number of secondary electrons emitted from the emitting surface, T is the ratio of transmitted to incident electrons for the section, and δ_2 is the section electron secondary yield.

2. A gun as described in Claim 1 wherein said transmitting and emitting section isolating the cavity from external forces to the cavity.

3. A gun as described in Claim 2 wherein the transmitting and emitting section includes a transmitting and emitting double screen.

4. A gun as described in Claim 3 wherein the producing mechanism includes a mechanism for producing an oscillating electric field disposed adjacent the RF cavity that provides the force and has a radial component that confines the electrons to a region between the respective double screen and the corresponding emitting surface.

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5. A gun as described in Claim 4 wherein the respective double screen is of an annular shape.

Cancel Claims 6 and 7.

8. A gun as described in Claim 4 including a mechanism for producing a magnetic field disposed adjacent the RF cavity to force the electrons to stay between the respective double screen and the corresponding emitting surface.

9. A method for producing electrons characterized by the steps of:

moving at least a first electron in a first direction;

striking a first area with the first electron;

producing additional electrons at the first area due to the first electron;

moving the additional electrons from the first area to a second area; and

transmitting the additional electrons through the second area and creating $\delta_2[\delta_1(1-T)]$ secondary electrons due to the additional electrons from the first area striking the second area, where N is an integer greater than or equal to one, δ_1, is the number of secondary electrons emitted from the emitting surface, T is the ratio of transmitted to incident electrons for the section, and δ_2 is the section electron secondary yield.